Physics activities in Atlas – Introduction

I. Hinchliffe

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This session

- Agenda

  09:00 Introduction and OMB item: Ian Hinchliffe (LBNL)
  09:15 Higgs: Atlas studies and status Bruce Mellado (Wisconsin)
  09:55 Susy in ATLAS: Frank Paige (BNL)
  10:35 Coffee
  10:55 Top and electroweak: John Parsons (Columbia)
  11:30 G4 physics issues: Peter Loch (U. Arizona)
  12:00 Heavy Ions: Helio Takai (BNL)
  12:30 Little Higgs models & future plans including physics in DC2: Ian Hinchliffe (LBNL)

  Speakers note that you will not be allowed to run over

- For more information look at all the talks from the recent Athens Physics workshop that are archived in the agenda system and accessible via $(Atlas - home - page) \rightarrow (Agenda - and - minutes)$

DOE request

OMB wants metrics to measure performance. Here are the proposed ones for future.

HEP Long Term Goals

The following indicators establish specific long-term (10 year) goals in Scientific Advancement that the HEP program is committed to, and progress can be measured against. These goals correspond very roughly to current research priorities, but are meant to be representative of the program, not comprehensive.

For these purposes, ***"Success"*** ~ Challenging but achievable under current assumptions (budget, schedule, technical, physics)

"Minimally effective" ~ the level below which most researchers would agree this effort has failed to achieve its scientific objectives

HEP Long-term Goal	***Definition of: "Success"***	***" Minimally Effective"***	***Exp'ts***	***Contacts***	***Status***
Confirm the existence of new supersymmetric (SUSY) particles, or rule out the minimal SUSY "Standard Model" of new physics.	Extend supersymmetric quark searches to XXX GeV (YYY GeV)at the Tevatron (LHC)	Extend supersymmetric quark searches to ZZZ GeV at the LHC.	CDF Dzero ATLAS CMS	Lockyer, Ristori; Womersley, Blazey; Willis, Gordon; Green	Contacte d
Discover or rule out the Standard Model Higgs particle, thought to be responsible for generating mass of elementary particles.	Discover (>5 standard deviations) a new particle consistent with the Standard Model (SM) Higgs up to a mass of XXX GeV, or rule out (95% CL) such a particle up to a mass of YYY GeV.	Observe evidence for (>3 standard deviations) a new particle consistent with the SM Higgs up to a mass of YYY GeV or rule out (95% CL) such a particle up to a mass of ZZZ GeV.	CDF Dzero ATLAS CMS	Lockyer, Ristori; Womersley, Blazey; Willis, Gordon; Green	Contacted

Measure the matter-antimatter asymmetry in many particle decay modes with high precision.	Measure the matter-antimatter asymmetry in the primary (J/psi Ks) mode to a precision of 2% and the asymmetry in five more difficult modes to a precision of 10 to 15%.	Measure the matter-antimatter asymmetry in the primary mode to a precision of 3% and the asymmetry in five more difficult modes to a precision of 15 to 20%.	BaBar	Giorgi	Contacted
Measure particle-antiparticle "mixing" in the Bs meson system or establish lower limits that are in conflict with Standard Model predictions.	Observe (>5 standard deviations) or rule out (95% CL) Bs mixing at a frequency consistent with Standard Model predictions.	Observe evidence for (>3 standard deviations) or rule out (90% CL) Bs mixing at a frequency consistent with Standard Model predictions.	CDF Dzero	Lockyer, Ristori; Womersley, Blazey;	Contacted
Directly discover, or rule out, new particles which could explain the cosmological "dark matter".	Discover (>5 standard deviations) or rule out (95% CL) new particle(s) consistent with cosmological dark matter (e.g., supersymmetric neutrinos)	Observe evidence for (>3 standard deviations) or rule out (90% CL) new particle(s) consistent with cosmological dark matter.	CDF Dzero ATLAS CMS GLAST CDMS	As above plus: Michelson; Akerib, Cabrera	Contacted

Determine the pattern of the neutrino masses and the details of their mixing parameters. Ascertain whether a measurement of the matter-antimatter asymmetry in the neutrino sector is feasible.	Determine whether observed (solar) neutrino mass difference applies to the lowest-lying or uppermost pair of neutrino states. Measure atmospheric neutrino mass difference to XX% using accelerator neutrino beams. Determine requirements for a neutrino source that could produce discovery (>5 standard deviations) of CP Violation in the neutrino system.	Measure atmospheric neutrino mass difference to YY% using accelerator neutrino beams. Determine requirements for a neutrino source that could produce discovery (>5 standard deviations) of CP Violation in the neutrino system.	MINOS Mini-BooNE	Wojcicki, Michael Conrad, Louis	Contacted

Yes this is silly and reflects a fundamental failure of understanding about what research is about.

The definition of failure should be that you find exactly what you are looking for because in this case you have learned nothing new and the experiment was useless!

However, here is is an attempt to make something sensible from it (Thanks to Frank)

I would try to add another item to their list to get this across.

GOAL: Expand our knowledge of the interactions and properties of fundamental particles.
MINIMAL: all the items in the minimal list below
OUTSTANDING SUCCESS (exceeds expectations is the phrase I want) : The discovery of a particle or phenomenon NOT on the list below and currently unexpected by theoretical ideas.

GOAL: Discover or rule out Standard Model Higgs bosons in the whole allowed mass range, $M_H > 114 GeV$ from current data and $M_H < 800 GeV$ from consistency of the model.
MINIMUM(ATLAS/CMS): Do this with with $\geq 5\sigma$.
SUCCESS: Measure mass with a precision of a few parts per mil for masses below 250 GeV and few per cent for higher masses. Determine the couplings of the Higgs to several other standard model particles.

GOAL: Discover or rule out SUSY at the TeV scale.
MINIMUM(ATLAS/CMS): Discover or rule out squarks and/or gluinos with masses below 1.5 TeV in Msugra and some other models
SUCCESS(ATLAS/CMS):Discover or rule out squarks and/or gluinos with masses below 2 TeV in a large class of models. For squark/gluino masses below 1 TeV, measure decays into several channels and determine masses of other supersymmetric particles produced in their decays.

GOAL: Measure matter-antimatter asymmetry. I would leave this to other experiments given the current successes of Belle/BaBar and our trigger descoping

GOAL: Discover or rule out new particles that could explain dark matter.
MINIMAL. (atlas/cms). Provide constraints on supersymmetric dark matter candidates.
SUCCESS. Exclude or discover the particle responsible for dark matter if is described by some models (for example Msugra) and its mass is below 300 GeV.
OUTSTANDING SUCCESS (exceeds expectations): discover the particle that is responsible for dark matter.

GOAL: Determine neutrino masses and mixings.
We should not rise to this bait

We your comments and feedback. However we only got 72 hrs notice and the response is due at the end of today!!! Catch either Frank or me before 2:00 pm.

If you have text to suggest, send it to me before 2:00 pm today.